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Feasibility of energy justice: Exploring national and local efforts for energy development in Nepal

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ABSTRACT

The energy justice framework serves as an important decision-making tool in order to understand how different principles of justice can inform energy systems and policies. The realization of the urgency of providing modern energy technology and services particularly to rural areas has prompted both the Nepalese government and development institutions to focus on community-run renewable energy facilities. It is argued that off-grid and micro-scale energy development offers an alternative path to fossil-fuel use and top-down resource management as they democratize the grid and increase marginalized communities' access to renewable energy, education and health care. However, Nepal's energy development is also heavily influenced by demands from the fast-growing economies of neighboring countries such as China and India. As a result, this article evaluates the Nepalese national energy policies by applying the key aspects of the energy justice framework and showing the feasibility constraints due to geopolitical and biophysical factors to the implementation of energy just policies in this developing country context. The empirical evidence is derived from interviews during a one-month fieldwork in the Lalitpur and Katmandu districts of Nepal, site-visits, discourse analysis of expert statements, government policies and newspaper articles as well literature review on peer-review articles.

1. Introduction

Many contemporary debates around energy, revolve around security, climate change mitigation and poverty alleviation. Energy is considered as one of the principles in achieving the sustainable development goals (SDG) and increasingly questions are also being asked about the links between ongoing energy development and justice, equity and fairness. In order to raise awareness of the social dimensions of energy policies, the seventh SDG has been introduced in order to recognize access to clean and affordable energy as a universal right (UNDP, 2016).

Energy justice is thus an inspiring approach for scholars and decision-makers who want to engage with questions such as what energy is used for, what values and moral principles ought to guide energy decisions as well as who benefits and loses (McCauley et al., 2013; Jenkins et al., 2016; Sovacool et al., 2016). Sovacool and Dworkin (2015) have detailed several ways of utilizing these considerations in the energy justice-framework. Due to its interdisciplinary nature - ambitiously bringing together the philosophical concept of justice with energy studies - it is important to clarify the framework's potential applications. In it, it is clearly stated that energy justice can be used in three ways: As a concept for philosophers and ethicists to better integrate distinct distributive and procedural justice concerns; as an analytical tool for researchers striving to understand how values are presented in energy systems and/or energy related conflicts; and as a decision-making instrument that assists energy planners and consumers in making more informed energy choices. This article aims to evaluate Nepalese national and local energy efforts by applying the key aspects of the energy justice-framework, in particular its reflections on availability, affordability, intra- and intergenerational equity, and sustainability. It concludes by highlighting the importance of the feasibility constraints such as biophysics and geopolitics as these can pose limitations to implementing energy just policies and thus also to the energy justice framework applicability when moving from ideal to actual conditions.

Nepal is among one of the world's least developed countries, with one of the lowest energy consumption per capita in the world, and further has no major reserves of coal, natural gas or oil (Sovacool et al., 2011; Gurung et al., 2013). According to Herrington and Malakar (2016), the high magnitude earthquake in April 2015 aggravated the situation of energy access as around 30% of the electricity infrastructure of Nepal was damaged. Apart from that, Nepal is also the world's

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most recent republics due to the peace process that followed a decade-old political instability. According to Nepal and Jamasb (2011), to the civil war between the Maoist rebellion and the government of Nepal meant that political instability severely affected the state-owned sectors, including the energy sector, leading to fragmented leadership, changing priorities and policy discontinuity. During the peace process, the post-conflict government has introduced a number of reforms. Among those is a Rural Energy Policy (REP), that aims to ensure access to clean, reliable and appropriate energy in the rural areas, and to strengthen the local governance structures. In parallel to this development, bottom-up movements such as community groups have also mobilized to extend the coverage of the electricity network.

In addition to that, the realization of the urgency of providing modern energy technology and services, particularly to rural areas, has prompted the Nepalese government and development institutions such as the World Bank and the UNDP to support community-run renewable energy facilities. Due to its mountainous terrain Nepal has potential to generate significant amounts of energy through renewable sources, especially from micro hydro schemes. This is seen as a cheaper and more feasible way of providing modern energy for remote areas, because connecting remote areas to the national grid is costly. Several community-based initiatives now promote the adoption of a decentralized renewable energy management. It is claimed that such inclusive, co-operative approach with local governance structures can extend the access to and availability of renewable energy to all community members with particular attention to vulnerable members like women, Dalits (often viewed as the lowest social caste) and indigenous people (UNDP, 2012). However, scholars like Nightingale (2002), Jones and Boyd (2011) have pointed out that asymmetry in power relations within communities on the basis of wealth, status, gender and caste, may influence the ability to equally derive benefits from such development projects.

As an approach to analyze complex dependencies between energy systems and its socio-political environment, including aspects of power asymmetries, the energy justice-framework is introduced in this article as an instrument for informing decision-making processes. It is used as a way of understanding how principles such as availability, affordability, inter- and intragenerational equity and sustainability play out in Nepalese energy policies and practices. While decentralized renewable energy development is in progress at the community level, the Nepalese energy development is also heavily influenced by the relationship with fast-growing economies of neighboring countries such as China and India. Equal access for all and inter- and intragenerational equity are some of the principles that drive community-run renewable energy development. Yet at the same time national and regional energy actors argue for fossil-fuel development through utilitarian values such as national interest and dependency.

The contributions of this article are three-fold. Firstly, it contributes to an understanding of opportunities and challenges for energy transitions in Nepal by relating to the key aspects of the energy justice-framework. Secondly, the article fills a gap in the research literature regarding energy justice in a least developed country-contexts. Thirdly, it discusses how energy justice ideals in Nepal can be constrained by different factors such as natural events, geopolitics, scarce economic resources and poor infrastructure. This is done by introducing the notion of feasibility, which functions as a boundary-concept facilitating communication and understanding across disciplines and between different contexts and stakeholders. Through this concept the article consequently offers a critical assessment of the energy justice-framework's applicability in the Nepalese context as well as of the framework itself. The empirical evidence is derived from interviews during a one-month fieldwork in the Lalitpur and Katmandu districts of Nepal, site-visits, discourse analysis of expert statements, government policies and newspaper articles as well literature review of peer-reviewed articles.

The article is organized as follows. Section 2 briefly provides an overview of energy systems, electricity access and local initiatives in Nepal. Section 3 introduces the research design, the energy justice-framework, feasibility constraints and the ways in which the energy justice framework is used as a decision-making tool in this article. In Section 4, the findings of the analysis related to the framework's principles are presented and discussed. Finally, Section 5 concludes and offers some policy recommendations.

2. Nepal: energy background

Nepal is a country rich in natural resources, which can be utilized for renewable energy production, especially in the form of electricity from hydro, solar and wind power. However, due to political, technical and economic challenges the majority of Nepalese people still rely on traditional energy sources such as biomass (fuelwood, dung cake, rice husk) as they lack access to the infrastructure needed for modern energy forms (Gippner et al., 2013). When it comes to fuel type, biomass fuel from wood constitutes the largest share of the consumed energy (76%), followed by petroleum products (8%), animal waste (6%) and agricultural residues (4%) (Surendra et al., 2011). The demand for petroleum products is solely met by imports, consuming more than 40% of the total export earnings of Nepal (APEC, 2014). The residential sector (mainly cooking, heating, animal feed preparation and lightening) is the most energy-consuming sector with a share of about 89% followed by the industrial and transport sector (Surendra et al., 2011). Although agriculture remains an important source of growth in Nepal and the largest employment sector for a large segment of the population, its share in energy consumption is low, amounting to 0.9% of the national energy used in 2008/2009 (Surendra et al., 2011; World Bank, 2015). This is due to the low degree of mechanization of agriculture (Chetri, 2007).

According to Nepalese scholars and energy experts, there is a need for a paradigm shift from top-down and foreign-dependent energy development towards decentralized and self-sufficient energy systems (Jamasb, 2006; Bhattacharya, 2007; Nepal and Jamasb, 2011). As in most developing regions, the centralization-paradigm in energy development and management practices in Nepal mainly applies to the supply of energy to urban areas. By contrast, a majority of rural populations are disconnected from centralized energy systems (Chetri, 2007). This is also reflected in the use of electricity as an energy source. According to data from 2010, electricity constitutes only 2% of the total energy consumption, whereas petroleum products and coal represent 9% and 2%, respectively (MOF, 2011; Gurung et al., 2011).

Approximately 70% of the total population has access to electricity and out of this share, 45% uses the national grid while 25% uses off-grid solutions such as solar and micro-hydro power (Kumar et al., 2015). Currently, Nepal faces structural challenges in its electricity sector such as a burden of price subsidies, low service quality, low bill collection rates and high losses due to poor network and service coverage experienced under state-owned and controlled systems (Nepal and Jamasb, 2011, 2012).

The Alternative Energy Promotion Center (AEPC), established in 1996, is as a central organization of the Government of Nepal aiming to promote alternative energy development, particularly in rural areas. By 2014 more than 1000 micro hydro power plants with a total capacity of 25 MW had been installed. Through the National Rural and Renewable Energy Programme (NRREP), the government of Nepal has aimed to install micro/mini hydropower for electricity to an additional 150.000 households in the programme phase between 2012 and 2017. It is now argued that coordination between the Nepal Electricity Authority (NEA) responsible for extending the grid to rural areas and the AEPC needs to improve for example to avoid redundancy of micro hydro power installations with grid extension and better prepare for grid connection. Some end users as grinders, saw mills and oil expellers are further reluctant to switch to NEA grid because of unreliable supply or prominent problems such as load shedding (Kumar et al., 2015).

The desired energy transition in Nepal runs along two parallel processes: a transition from low-access to high access to modern energy for the population, and a transition from fossil-fuel based energy to renewable energy. For instance, the environment-friendly vehicle and transport sector aims at increasing the share of electric vehicles to 20% by 2020 by providing a subsidy scheme of for the promotion of electric and non-motorized vehicles (Government of Nepal, 2016). Also, the Community Rural Electrification Programme (CREP) and Rural Energy Policy (REP) are major reform packages, which aim to achieve these goals by decentralizing the grid by mobilizing several actors for the development and expansion of rural energy resources, such as local institutions, rural energy user groups, non-government organizations, cooperatives and private sector organization (REP, 2006). The core idea in CREP is to provide rural electrification by grid-extension projects that are co-financed together with communities (CREP, 2011). According to this programme, the government carries 80% of the project costs, whereas the remaining 20% of the costs have to be covered by the communities. In order to receive government subsidies, a community has to be registered as a legal entity on the district level (CREP, 2011). As a result, around 207 community based organizations (CBS) exist in 47 districts (personal communication). CREP also allows community based organizations to distribute their own electricity but also to be responsible for any non-technical losses such as theft.

The REP for rural electrification introduced another reform package. The aims of this policy can be summarized as promoting clean energy sources by reducing the dependency on traditional energy, increasing the living standards of the populations by integrating energy with social policies and endorsing small and micro-scale hydropower as a main energy source for rural electrification (REP, 2006: 2).

The move towards low-carbon economy through energy transition is one of the core elements of climate change mitigation (UNFCC, 2015). According to the Special Report on Renewable Energy Sources and Climate Change prepared by IPCC (2011), accelerating renewable energy development is important not only to reduce carbon emissions but also for increasing the access to energy for the 1.4 billion people without access to electricity, and for the additional 1.3 billion using traditional biomass. From a sustainable energy transition perspective, Nepal can be seen as a unique case due to its geographical advantages such as high altitude, rich water resources fed by glaciers and a high amount of sunny days.

3. Methodology and theory

The proposed project is designed as a case study. According to George and Bennett (2005:4–5) case studies are well-suited to the analytics of process tracing. In this context, the energy development in Nepal is an example of what Flyvbjerg (2011) calls a 'critical case', defined as having strategic importance in relation to the problem of lack of access and of fossil-fuel based energy systems. Nepal provides an interesting context for studying energy justice with its critically low energy consumption per capita as well as its geopolitical situation as a landlocked country between China and India.

In order to provide a comprehensive view on energy transition and efforts in Nepal, we adopt a mixed-method approach combining semi-structured interviews, field observation in hydropower sites, in the Lalitpur district of Nepal and in Kathmandu with discourse analysis of major policy documents and news article. The primary data is supported by secondary sources, such as literature review of reports and peer-reviewed articles. During our one-month fieldwork in November 2014, we conducted interviews with actors ranging from Lalitpur Energy User Association, community based organizations, Nepal Electricity Authority to villagers, engineers and bureaucrats in order to understand local and national energy efforts and challenges. Most interviews were conducted in Nepali with the help of a simultaneous translator. These interviews are complemented with our analysis of two energy reforms packages, namely the Community Rural Electrification Programme (CREP) and the Rural Energy Policy (REP). In addition to that, we have also supplemented our data with other NGO reports such as Climate Scenarios and Vulnerability Report for Nepal in order to understand the future feasibility of suggested energy efforts.

We use discourse analysis as a tool to organize data derived from textual sources such as media sources and energy reform packages. The data has been organized according to central categories emerging from the energy justice-framework (Sovacool et al., 2016): availability, affordability, intra- and intergenerational equity, due process, responsibility and sustainability. We then critically engage with the framework's principles by outlining the feasibility constrains that emerge in this particular developing country context. In order to capture the interlinkages between policy and practice, we follow a broad definition of discourse as an "ensemble of ideas, concepts and categories through which meaning is given to social and physical phenomena, and which is produced and reproduced through an identifiable set of practices" (Hajer and Versteeg, 2011).

3.1. The energy justice-framework

Analyzing fifteen years of energy scholarship, Sovacool (2014a, 2014b), has identified a critical need to integrate social science related disciplines with energy studies. There is a growing literature that seeks to understand energy as part of social systems (Miller, 2012; 2013) and acknowledgement of the importance of its interlinkages to human behavior (Agyeman and Kolmus, 2002; Dow and Hobman, 2013); to community structures (Islar and Busch, 2016); to political economy of resources (Islar, 2012; Harnesk and Brogaard, 2016); to history (Pearson and Foxon, 2012) and to relations of power (Stirling, 2014). In line with this literature, in this article we define energy as a socio-political relation: social as it is embedded in our social organization and most aspects of life are dependent on it; and political because the development of state policies and geopolitics have crucial impacts on energy decisions and choices, and vice versa. As Sovacool et al. (2011) have pointed out, it is first and mostly economic and political factors such as the political capacity of institutions that enables the environment necessary for energy systems. This contrasts with more technocratic views which put physical capacities of that technology at the center of their concern.

The energy justice-framework has been an inspiring approach for scholars and decision-makers who perceive energy as part of social systems. Such an approach helps to make more visible social aspects of energy transformation that otherwise go unrecognized and unacknowledged (Miller et al., 2013), by engaging with questions such as what energy is used for, what values and moral principles ought to guide energy decisions as well as who benefits and loses from them (McCauley et al., 2013; Jenkins et al., 2016; Sovacool et al., 2016). According to Sovacool and Dworkin (2015), an important dimension to justice goes beyond the concepts to concerns related with decision-making processes. In line with this, they identified several different principles that could be used to inform policy makers. Below we list six principles adapted from their approach (see Sovacool and Dworkin, 2015:438).

1. *The availability principle* argues that all ought to have sufficient energy resources of high quality;
2. *The affordability principle* argues that all people, including the poor, should pay no more than 10% of their income for energy services;
3. *The due process and good governance principle* argues that countries should respect the rule of law and human rights in their production and use of energy and that all people should have access to high-quality data about energy and the environment and that communities must have access to fair, transparent, and accountable forms of energy decision-making;

4. *The Intragenerational equity principle* is a principle which argues that people have the right to fairly access a certain set of minimal energy services enabling them to enjoy a basic minimum of well-being;
5. *The Intergenerational equity principle* is a principle which argues that future generations have a right to enjoy a good life undisturbed by the damage our energy systems inflict on the world today;
6. *The Responsibility and sustainability principle* refers to all nations' duty to protect the natural environment and its sustainability as well as minimize energy-related environmental threats.

According to Sovacool and Dworkin (2015), the energy justice framework offers itself as a novel conceptual tool for ethicists, an analytical tool for energy researchers, and a decision-making tool for policy-makers. At the level of ethical principles, it is ranked in a hierarchical order moving from simplicity and broad acceptability to more complex intuitions, which fuse moral concerns about the costs, benefits and procedures of energy policies from different ethical traditions.

The outcome is in the above sketched as six principles. Theoretically, they span across deontological ethics, binding our courses of actions according to certain duties, a libertarian emphasis on freedom, choice and opportunities, procedural concerns about justice as recognition and utilitarian elements through the focus on the amount of good quality lives for people. Energy justice then implies respecting universal human rights and ensuring that every person has a right to the level of energy required to attain a minimum of wellbeing. At the same time, the framework also appeals to certain weighing principles, that is, principles allowing us to weigh and rank the different normative considerations that should impact our decisions. These include sufficientiarianism, which is visible in the principles of availability and intragenerational equity, and holds that for a distribution to be fair all must receive sufficient amounts of goods to meet their basic needs or capabilities (Huseby, 2010; Sen, 1982). It also includes egalitarianism, which holds that for a distribution to be fair, all persons must have equal shares of goods. It features, explicitly or implicitly, in all of the energy justice principles (Holtug and Lippert-Rasmussen, 2006:2).

In the following we apply the energy justice framework reflexively to the case of Nepal. This gives rise to two fundamental questions to the framework. First, while egalitarianism, libertarianism and utilitarianism may all be said to ascribe equal moral weight to all persons, they do so in different ways. Thus, given the width of the normative concerns invoked by the framework's comprehensive conception of energy justice, the different principles may come at odds with each other (Sovacool and Dworkin, 2015: 440). This can create weighing dilemmas between the different principles and we therefore ask how these play out in the case of Nepal. Second, at the general level, we may ask whether the framework's ideal principles can be applied in real-world contexts, including as a decision-making tool for policy-makers in Nepal.

3.2. Realistic utopias and the notion of feasibility

While the idea of any kind of justice relies on separating what is the case from what ought to be the case, it is also constrained by the idea that 'ought' implies 'can' (Wiens, 2014). Navigating this gap between descriptive and prescriptive claims requires the formulation of "realistic utopias" (Rawls, 1999) and highlights the importance of the feasibility of normative principles when these are applied to real-world contexts (Kukathas, 2004). In our analysis, we interpret the specificities of the Nepalese case as constituting certain feasibility constraints on the energy justice-framework. Talking about feasibility constraints means asking whether the framework's principles are applicable in different contexts by identifying the kinds of barriers they face (Lægaard, 2008). The idea of feasibility constraints thus functions as a boundary concept through which different dimensions of energy policies can be discussed across disciplines and between different stakeholders. It also allows us to address the question of agency, that is, to discuss which various agents which can or should assume the responsibility of implementing energy justice, and the different circumstance they work from. The energy justice framework comprises a set of global ideals for energy justice, but the extent to which they can be action-guiding can vary greatly between developed, developing and least developed countries. Thus, paying attention to feasibility, any policy recommendations for Nepal must therefore take these specificities into account when determining how to move the country's energy policies closer to the framework's principles.

Sovacool (2012: 279) has discussed a range of barriers to alleviating energy poverty, focusing on different kinds of private and public efforts and the political, financial, logistical and local barriers they face or create in developing countries. These barriers can be viewed as various feasibility constraints operating on the energy justice framework's principles. Sovacool views these as confirming the socio-technological nature of the implementation of new energy technologies. This nature, he says, therefore requires policymakers to expand their perspective beyond technical issues to more comprehensive policies. While the energy justice framework accomplishes this by offering a set of principles on which to build such policies, conceptualizing various barriers as feasibility constraints on the ideals directs focus to the practical and ethical dilemmas policymakers can face without reducing these to socio-technological obstacles.

4. Results and discussion

A closer look at the principles and feasibility constraints in the context of energy policies and implementation in Nepal helps us to detail how energy justice is understood and challenged across a range of scales. Below, an adapted version of Sovacool and Dworkin's framework detailing five core principles, is used to analyze literature and our results in relation to the Nepalese energy policies. In our adoption of the framework, good governance is integrated as a tool to provide intra-generational equity as our data does not cover participatory processes, but rather illustrate the potential implications of the suggested policies.

4.1. Availability of energy in land-locked country

"Outside the major cities, life in rural Nepal comes to a halt every time the sun goes down" (Rana, 2012).

The principle of availability is considered one of the core elements of the energy justice framework as several of the other principles can only be achieved when there is enough supply of energy that is in sufficient quantity and quality (Sovacool, 2013). The availability of energy resources entails providing uninterrupted and adequate supply with a lower degree of dependency on foreign imports of fossil-fuel. In this context, the availability of energy sources in Nepal is at a critical stage. Although developing, Nepal's energy supply cannot meet the demands of the population.

Situated in between two giant fossil-fuel economies, China and India, the geo-political position of the Nepal creates challenges for ensuring a stable, self-sufficient and decentralized energy systems. As a landlocked country, Nepal is heavily dependent on both India (61% of all imports) and China (15% of all imports) for overland supplies ranging from medicine to petroleum products (OEC, 2015) and nearly all fossil fuels imported to Nepal are imported and refined in India (Surendra et al., 2011). At the same time, biophysical challenges such as landslides and earthquake mean that the roads to the Chinese border can be blocked for months and prevent people from having access to range of goods including petroleum (personal communication). This dependency situation has forced the Nepalese government to propose creative solutions such as the 'energy bank' proposal with India, which

relies on seasonal energy exchange between two countries. If approved, Nepal will export surplus electricity produced by hydropower plants at the border during the monsoon season, while it will import power during the winter where the country typically faces severe energy power-cuts (Kathmandu Post, 2016/05/27). However, political challenges such as the India-Nepal border blockage in 2015 can worsen the dependency situation. Thus, the blockage of Indian borders due to the political disputes at the major supply route from India led to shortage of critical supplies, such as fuel, medicine and food in post-earthquake Nepal (Herrington and Malakar, 2016). This severely hampered the recovery and reconstruction efforts after the earthquake as the limited availability of energy resources affected critical facilities such as ambulance services, schools and universities, and local transportation (Herrington and Malakar, 2016). In order to reduce total dependency on India, Nepal has therefore entered into agreements with the Chinese government such as the Sino-Nepal transit trade agreement that allows Nepal an access to the sea through the use of the Chinese port of Tianjin (Reuters, 2015). This agreement is claimed to end India's monopoly over Nepal's transit trade (Asian times, 2016/03/).

Several times since the earthquake in 2015 the Nepalese authorities have declared energy emergencies (NEA, 2016). The Nepal Electricity Authority (NEA, 2016) has provided a load shedding schedule and forecasts for increasing demand in order to prepare the people for power cuts. Load shedding refers to a deliberate shutdown of electric power in a part or parts of a power-distribution system, in order to avoid the failure of the entire system when the demand limits the capacity of the system. Accordingly, NEA can only provide electricity for an average of eight hours a day to the capital of Nepal, Kathmandu. The rest of the day electricity is supplied based on the NEA's load shedding accounting (Sovacool, 2013; NEA, 2014). Consequently, most of the activities in the urban setting ranging from household to shopping by foreign tourists are shaped according to this schedule as candles and other methods are used for lighting.

For the rural part of the population, around 60% in Nepal, the access and thus availability of electricity is an even bigger challenge. The areas covered by the national grid are limited due to communities' remote topography, dispersed settlement pattern, and the limited financial resources of the Government of Nepal (REP, 2016; AEPC, 2011). Owing to this, small-scale renewable energy technologies such as micro-hydro, solar and wind are promoted as they are relatively cheaper and financially feasible compared to grid extension to mountainous areas. However, in areas that are much closer to the national grid, grid extension movements have emerged since around 1997 (personal communication). These eventually led to the creation of the National Association of Community Electricity Users of Nepal (NACEUN) in 2005, which includes 252 community cooperatives and gives technical assistance and expertise in providing access to electricity via grid-extensions (personal communication). In this sense, together with government initiatives, the role of different communities in Nepal is crucial in enforcing energy justice for urban and rural populations, by advocating and fighting for the actual realization of the principle of availability across a range of challenges such as landlocked geography, fragmented grid coverage, geopolitical agreements and conflicts. These feasibility constraints to the application of the availability principle have therefore led to different forms of agency in the case of Nepal.

The geopolitical dimension to energy illustrates that while Nepal's economic situation and biophysical characteristics have a major impact on the country's energy availability, the required technologies may become available through agreements with countries like India and China, through development aid, or private investors. Unlike natural events like floods and earthquakes, the development of the required technological infrastructure making adherence to the energy justice principles possible, is therefore most often contingent on political choices. Thus, Nepalese policy-makers may choose to strengthen the indigenous technological capacity, which is indeed what the many local grid-extension movements in NACEUN are calling for, but they may also agree to technological transfers through development aid or geopolitical relations with China and India. In this sense, we can say that Nepal's technological constraints to the principles of the energy justice-framework must be considered in connection to national and geopolitical political processes.

4.2. Affordability via organized collective action

In the case of Nepal, affordability as an energy justice concern is crucial. As a low-income country, Nepal has financial difficulties in meeting the growing demand for modern energy and electricity and securing a reliable energy supply for most of its population.

In the context of the energy justice-framework, the principle of affordability is mostly linked with affording the costs for establishing a secure energy access. This principle was mentioned several times in our interviews and a cooperative approach and solidarity economy were referred to as ways to extend the access to and affordability of energy to all community members with particular attention to vulnerable members like women and Dalits (often viewed as the lowest social caste). (Personal communication; UNDP, 2012). Local bodies such as community user groups are common in Nepal, not only for dealing with issues related to energy access and affordability but also for managing water and forest resources. Traditionally, there is an acceptance of organized community and institutional diversity ranging from NGOs to cooperatives and user groups. Development agencies and government initiatives often collaborate with these (organized) community groups in order to finance the initial costs of projects. In the context of renewable and clean energy, the implementation of small-scale biogas technologies is one example. Biogas technology has been distributed by the government throughout the country since 1975 through subsidies for construction. As a country with a large agricultural sector the potential for cleaner, safer and more affordable fuel for cooking is huge and the slurry from the plants is then used as fertilizer. The biogas support programme was set up in 1992 with support from the Netherlands, between 1997 and 2011 from the German Government, and since 2010 through the Clean Development Mechanism. Since 2009, the Nepal Biogas Promotion Association (NBPA), an umbrella organization of biogas companies, have been responsible for the programme and over 260,000 biogas plants have been installed (Cheng et al., 2014). Biogas projects are often initiated through the same cooperatives that manage village based electrification projects (personal communication) and a Biogas Credit Fund has been set up to ensure affordable energy by providing loans to the cooperatives.

Organized collective action is seen as a way to fulfill the needs of the community and to be self-reliant in areas where the state has failed to reach. The 80/20% rule in the grid extension policy is one of the examples of collaborative economy in Nepal: While NEA pays for 80% of the costs such as the high capacity highware, the community shares the 20% of the costs in the form of labor, control and/or financing the low capacity transmission lines. As a result, villages can be connected to the national grid and can own the electricity distribution. According to Pandey (2009) this creates a sense of ownership leading to a lower rate of electricity theft in community-owned electricity distribution areas compared to NEA-owned electrified areas. Following the approach of Ribot and Peluso (2003), where access is defined as the ability to derive benefits from things, one can question the heterogeneity of households within communities' in terms of being able to afford the necessary costs and benefit from electricity distribution. According to our respondents, most communities acknowledge such differences, and therefore opt to set two different tariffs: a flat tariff for those who can afford it, and a pro-poor tariff in order not to put more burden on poorer households (Personal communication).

The collective action of community user groups in order to remedy state failures to provide affordable energy has two implications: First, it shows that states may themselves constitute feasibility constraints to

the energy justice framework's principles. Second, it also illustrates how feasibility constraints (in this case both biophysical and political-technological) may prompt communities, through collective action, to assume some or all of the responsibility for discharging the principles of energy justice.

4.3. Good governance for intra-generational equity

"In Nepal, lost in the chaos of political upheavals, a silent revolution is afoot. In remote villages of this mountainous and energy-starved country people are demanding their right to electricity. They say electricity is a national good; everyone must have a right to it" (Batra, 2010).

The rural energy policy of Nepal emphasizes a shift to small-scale renewable energy technologies is stated strongly as a way to ensure better access to electricity, until the grid extensions reach also the more remote areas. The lack of access to electricity has several implications for intragenerational equity. It affects the duration of education, education opportunities, opportunities to improve and diversify livelihoods, the health of the rural populations and gender relations. Many reports produced by UN bodies (UNDP, 2007; UNESCAP, 2013; UNDESA, 2014) and the World Bank (2015) have discussed the implications: The lack of lightening of schools leads to frequent interruptions in the education system as classes are cancelled due to decreased natural daylight. Lack of adequate lights at home also influences education as students have difficulties in doing their homework. It has been reported that students usually have to go outside of their homes to streets where they study under streetlights. Another challenge is related to health, namely the lack of permanent and reliable energy supply for health centers. This is also confirmed by a respondent, stating: "we need to travel for hours in order to get health care in well-equipped and electrified medical centers" (personal communication).

Democratization of the grid through small-scale renewable energy has been a central discourse promoting Nepalese energy policies. This discourse can be understood and translated in the context of the energy justice framework through the principles of good governance and intra-generational equity as they suggest the involvement of all affected people, groups or states in decision making processes, rather than top-down governance, as well as people have a right to fairly access energy services (Sovacool, 2013).

One of our respondents argued that off-grid renewable energy systems as well as small-scale renewable energy development offer alternatives to top-down resource management as they democratize the grid and increase marginalized communities' access to renewable energy as well as education and health care centers (personal communication). Gippner et al. (2013)'s detailed analysis of micro-hydro schemes under the Rural Energy Development Programme financed by UNDP and World Bank, also shows the positive impact of electrification and community managed hydropower schemes on gender equity, income generation and climate mitigation. They pointed out that systematic community mobilization with significant women participation enhances the lifestyles of villagers through electrified irrigation systems, community computer centers and maternity ward.

However, poor institutional capacity, lack of coordination and inadequate implementation might lead to different results (Sovacool et al., 2011). Chetri (2007) points out that the actual implementation of renewable energy might still have crucial impacts on intragenerational equity, arguing that the lack of decentralization of programs and to authorities at the local level, poor people have not been mainstreamed to the technologies. As a result, the poverty gap between poor and rich is increasing as government subsidies often only reach to those who already have resources. Thus, some state-enacted renewable energy policies may actually widen the gap between the principles of good governance and intragenerational equity and the real-world conditions of the most vulnerable segments of the Nepalese population. According to Gurung et al. (2011), this is due to the current subsidy policy which is guided by "the bigger the better" and "the more the merrier" discourses, which forecloses possibilities for underprivileged groups including the poor and inaccessible rural communities (Surendra et al., 2011).

Several studies have also shown that in a rural context, "caste and ethnicity constitute important variables around which individuals, households, and communities aggregate for common action" (Jones and Boyd, 2011: 1265). As Nightingale (2011) also emphasizes, different elements of people's identities such as caste, gender and race do not operate independently, but rather function in complex ways to influence their degree of social and political power in Nepal. These complex identities and cultural norms, it is argued, are often neglected by decision-makers. Jones and Boyd (2011) identified a general caste-related political neglect by community leadership, government and NGO bodies in decision-making processes. This neglect is also confirmed by our interviews in relation to access to government incentives for community renewable energy development.

The government subsidies' increase of the poverty gap can be seen as constituting a feasibility constraint on the principle of good governance and intragenerational equity, as well as on the principles of availability and affordability. Hence, we might understand the contrast between the state's top-down approach and communities' preference for off-grid and small-scale renewable energy projects as showing how this feasibility constraint to a fair energy distribution is in conflict with the principle of good governance and due process. However, this example also points to an inherent tension in the energy justice framework itself, namely between, respectively, its utilitarian and its egalitarian and sufficientarian intuitions. Thus, the utilitarian ambition of subsidizing energy to reach a cumulative beneficial impact ("the more the merrier") may, if implemented without regard to already-existing social dynamics of marginalization and disenfranchisement, serve to undermine the availability and affordability of energy for the poor, thereby undercutting the ideal of good governance and intragenerational equity.

4.4. Sustainability, Intergenerational equity and energy systems

"The rainfall pattern is changed. Earlier we had small amounts of rain for a longer time, now we have intense rain for shorter period" (Forest user community group, personal communication).

In the context of energy justice, intergenerational equity refers to a principle, which argues that future generations have a right to enjoy a good life undisturbed by the damage our energy systems inflict on the world today (Sovacool and Dworkin, 2015). One of the major issues, which directly affect intergenerational equity in Nepal, is climate change. According to Walker (2012) climate change is the most revealing factor in justice issues as it confronts us with patterns of inequality and claims of environmental injustice, which threaten the current and future health and well-being of some of the poorest and most vulnerable people. And despite having one of the lowest contributions to global carbon emissions with only about 0.025% (Sapkota et al., 2014), Nepal is one of the most vulnerable countries to these climate change patterns. According to the ICIMOD report on climate change in Himalayas (Eriksson et al., 2009; Sapkota et al., 2014), rising temperatures lead to recession of glaciers and snow fields in Himalayas, which directly affects the supply of water for irrigation for Nepalese household use and hydroelectricity. Another concrete influence, confirmed also by our informants, is the shifting monsoon precipitation patterns. Nepalese farmers in both uplands and lowlands have been significantly affected by the climate change. Upland farmers have to some degree been reported to benefit from the change through increasing rainfall and temperatures, while lowland farmers are reporting later and insufficient rainfall in some years and flooding in others (Manandhar et al., 2011).

The report on climate scenarios in Nepal (NCVST, 2009:5) starts

with a concern on the final principles of the energy justice framework, namely responsibility and sustainability: "as one of the least significant emitters of green house gases, Nepal and Nepali people already face and would continue to face the problems that they had little role in creating. The impact is higher cost to its social and economic development". In the report, on the one hand energy issues are perceived as key to revealing this injustice, as it is estimated that rural communities living in the mountains might lose their energy sources for cooking or heating due to erratic climate-led events such as floods and forest fires. On the other hand, the report views renewable energy development as a solution to overcome the vulnerabilities created by the climate change. In this climate-energy nexus, energy compensation is often offered to ensure both climate and energy justice: "The additional cost of using such alternatives should be borne by developed nations, which should pay Nepal energy compensation for exposing it to the climate stresses associated with using fossil fuel. This payment would provide financial incentives to Nepal to switch away from fossil fuel toward an adaptive and non-polluting development pathway" along the lines of the "energy ladder", whereby people ought to transition towards more and more efficient forms of energy (Holdren and Smith, 2000; Barnes et al., 2004). This is also in line with the strategy of the Least Developed Country Group in the UN climate change negotiations, which is centered around the principle of common, but differentiated, responsibilities and respective capabilities[1] (UNFCC, 2015).

The principle of sustainability also concerns the longevity of energy resources. But here, the situation of renewable energy in relation to climate change is somewhat contradictory: On the one hand, the transition to renewable energy will reduce carbon emissions, but on the other hand, in countries like Nepal, both energy production and infrastructure, such as hydropower plants, will be at risk from climate change. Thus, according to the ICIMOD report (Eriksson et al., 2009), hydropower generation systems established on many rivers will be at risk if landslides and sudden floods increase. Our informants also state another problem such as the decrease in power production generated by (micro) hydropower plants due to decrease in already low flows during the dry season (personal communication and Shretsha et al., 2016).

As such, we can say that the biophysical prospects of climate change in the form of floods and landslides presents the ambition of energy justice in Nepal with a range of associated feasibility constraints such as failing hydropower generation systems if rivers rise suddenly, or, conversely, if water levels decrease further. The many different ways in which climate change may influence the future of citizens and communities in Nepal is an apt illustration of how the strong feasibility constraint posed by the biophysical reality of climate change can have multifaceted consequences for the ambition of energy justice. In so far that Nepal has contributed very little to the compounding factors behind this development, the principle of intergenerational equity seems to support a strong case for implementing compensational schemes to alleviate some of the feasibility constraints that climate change may pose on the pursuit of energy justice in Nepal. Also, the Nepalese case illustrates a potential conflict between the principles of good governance and intragenerational equity and those of responsibility and sustainability. Since the impact of floods, landslides and other climatic events can jeopardize the infrastructure needed for the transition towards future efficient and renewable energy, an argument exists against the universal aspiration of always climbing the "energy ladder". An alternative could be to allow local communities to use more inefficient, traditional energy sources, like biomass fuels when facing volatile times.

5. Conclusion and policy implications

This sections offers three conclusions. The recently adopted Sustainable Development Goal 7 (SDG7) on energy interconnects several issues ranging from health and education to gender equality and climate action. The energy justice-framework can serve to facilitate such a comprehensive understanding on energy by connecting energy systems with social and political systems, and a range of fundamental normative ideals. Given the importance of energy in human development, energy transitions need to be understood from multiple perspectives and disciplines. By using the case of Nepal in the context of energy justice framework this article demonstrates the importance of feasibility in realizing just energy decision-making in a least developed country context. The principles of the framework face different kinds of constraints and attention paid to geopolitical and biophysical realities are crucial in providing the basic conditions to implement just energy policies. The simple fact of the geographic remoteness of many Nepalese communities ensures the virtual impossibility of securing availability of energy to all citizens equally, and the 2015 earthquake shows how a catastrophic natural event may render political energy ambitions impossible from one day to another. Unlike natural events, like floods and earthquakes, the development of the required technological infrastructure facilitating adherence to the energy justice principles is therefore often contingent on political choices. Thus, Nepalese policy-makers may choose to strengthen the local technological capacity, by supporting local grid-extension movements in NACEUN, but they may also cultivate geopolitical relations to China and India by agreeing to technological transfers through development aid or trade. This however comes with the price of introducing other agents and interests into the Nepalese energy context, and these may not be as concerned with good governance, the plight of the poorest and the equity of present and future Nepalese populations. Such cases therefore illustrate that both geopolitical and biophysical events can present feasibility constraints to both the principles of availability and affordability, but also those of intra- and intergenerational equity.

Second, the implementation of the principles of energy justice requires attention to the problem of agency. Questions like who should hold the responsibility of discharging the principles need to be discussed more. The principle of responsibility and sustainability is explicitly tied to nations as these have a privileged position to enforce rules concerning all people. However, there are massive differences between nations, and while some may be able to meet most of the principles, others, most notably least developed countries, may not. Moreover, through state-systems, nations may also pursue for instance the availability principle, but do so in a top-down manner. This can challenge other principles, like those of good governance and intragenerational equity, which emphasize community involvement and redress. This also illustrates how the question of agency becomes more important in certain contexts: Other agents, like individuals, communal groups or other forms of collectives, may try to lift the responsibility of ensuring energy justice, when states fail. And the interactions of various agents may intersect or conflict: In some cases, collective groups may find their range of available paths toward energy justice either facilitated or constrained by agents, like states, donor countries, private or credit institutions, actors who then have the potential to promote – or complicate - energy justice.

Third, in the framework's important ambition to translate various strains of thought on justice to the context of energy lies also the risk that the pursuit of its principles may undermine the pursuit of other, more general, concerns of justice. The principles of energy justice may therefore also face ethical feasibility constraints. Such constraints do not affect all of the energy justice principles equally, since all but the availability and affordability principles actually appeal to energy in an instrumental manner, that is, as a means to ensure, respectively, the

[1] The principle of common but differentiated responsibilities evolved from the notion of the 'common heritage of mankind' and is a manifestation of general principles of equity in international law. The principle acknowledges historical differences in the contributions of developed and developing States to global environmental problems, and differences in their respective economic and technical capacity to tackle these problems (CISDL, 2002).

rule of law, human rights, wellbeing, the good life and the natural environment's sustainability. But while the concept of energy is a multidimensional concept intersecting with a range of other basic goods, like sustenance, housing, employment, education and health (United Nations Development Programme, 2010; see also Sovacool, 2012), for those two principles, dilemmas may nevertheless arise. This happens in cases where other normative concerns than the availability and affordability of clean and high quality energy seem to hold more urgent priority. While some households' reliance on traditional biomass fuels for cooking can be defined as energy poverty, the Nepalese case illustrates (Herrington and Malakar, 2016) that there might be other moral reasons, such as post-disaster recovery, why communities should be allowed to keep, or even to switch back, to less efficient energy sources, even if this constitutes a break away from the imperative of the "energy ladder". In such cases, policy makers also need to pay attention to the needs of the population in general, and local and vulnerable communities in particular, before implementing energy policies.

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